Analysis of the Implementation of the Occupational Safety and Health (K3) System and the Implementation of Risk Management in the Cipunten Agung Hilir River Flood Handling Construction Project, Labuan District

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ABSTRACT

Construction projects require working time specifications that need to be completed in a short time. But in practice, some interfere with the implementation. This study aims to determine whether the OHS system has been implemented in construction projects. The applications of risk management in construction projects. This study was conducted as part of the Cipunten Agung Hill River Flood Management Project in the Labuan District. The method used is the distribution of questions to be filled out by respondents who are involved in projects in the OHS Section. The type of research in this research is quantitative. Quantitative research is research that distributes surveys in the form of questionnaires to respondents and the data is processed to determine the correlation between the results of the data obtained. The results showed that the K3 system had been applied to the project by 64.8%. The most dominant variable affecting the implementation of the OHS system and the application of risk management in construction projects is that signs/signs/information about the project have been installed around the project site with a coefficient value of 6,053 and the variable that has the lowest effect on the application of the OHS system and the application of risk management to the project.

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1. INTRODUCTION

Construction project work requires a work schedule specification that must be completed quickly and precisely[1]. However, in practice, there are only a few things that can interfere with the work process. During the project, delays were caused by incidents with construction workers. Incidents to workers, especially in construction project buildings, can be reduced through risk management in the occupational health and safety protection section (K3)[2]. Indonesia is a country with a high number of work accidents. The data is collected by the Labor and Health Social Security Administration Agency (BPJS)[3]. From 2016 to 2019, the number of work accidents increased. According to the Social Security

Administration Agency (BPJS), there were 527,865 work-related injuries, 34% of which were accidents due to falls from heights, and were work-related injuries in the construction industry. In 2016 there were 101,368 work accidents per year. In 2017 there were 123,041 work accidents per year. On the other hand, in 2018, the number increased significantly to 173,415 people/per year. However, in 2019, the number decreased by 130,041. From this data, it can be concluded that the number of work accidents only experienced an increase and decrease in 2019[4]. However, in 2020 after the COVID-19 pandemic, it increased to 177,000 accidents. In this case, it is based on claims submitted to the BPJS which means the actual number is much higher because not all workers are members of the BPJS[5].

Article 59 (1) Article 2 of the 2017 Construction Services Law requires service consumers and service producers to comply with K4 support the implementation of construction services. The purpose and objective of Occupational Safety and Health are to make workers avoid incidents, and occupational diseases and create a protected, effective and useful work area[6].

After the 2018 Sunda Strait Tsunami, siltation occurred at the Cipunten Agung Estuary in Labuan province. Normalization is now being carried out by the government through the Central Cidanau River Basin Ciujung Cidurian (BBWSC3) Banten. The Shipunten Agung Hill River Flood Prevention Project in Labuan Province can pose a risk of work accidents. The project is built on a riverside ramming platform. In addition, the use of the tool in a river flood management project may create a risk of work-related injury[7].

Against this background, there are still many work accidents that occur in the industry. Therefore, the impact of the occupational health and safety (K3) program is significant to create a protected project area and prevent incidents and problems due to activities. Government efforts will not address this problem without action by the company and its employees. Therefore, researchers took observations regarding "Analysis of the Application of Occupational Safety and Health (K3) Systems and Application of Risk Management in the Cipunten Agung Hilir River Flood Handling Construction Project, Labuan District."

From the background of the problem, several formulations of the problem can be obtained, namely: whether the K3 system has been implemented in the Cipunten Agung Hilir river flood handling construction project, Labuan District, and what is the relationship between K3 implementation and the implementation of risk management in the Cipunten Agung Hilir river flood handling construction project, Labuan District, and what are the dominant factors that influence the implementation of OHS and the application of risk management in construction work for handling floods in the Cipunten Agung Hilir River, Labuan District.

Literature review, A 2015 study by I Wayan Wiyasa, based on this study, entitled "Occupational Health and Safety Risk Management in the Ciputra World Jakarta Development Project", identified 78 high risks. Up to 5 hazard levels for columns, beams and walls, up to 2 very high hazard levels (hazard levels) encountered in column construction and exterior wall repair work, and up to 1 hazard level. To minimize risks in construction, education regarding risks, occupational health and safety must be carried out for each worker, implementing shifts and rotating leave, carrying out health checks, and managing a dangerous and high-risk work environment[8].

In 2017, Reny Indrayani, as part of a health and safety risk analysis study on the development work of Terminal 2 at Universal Juanda Airport in Surabaya, based on a root cause analysis of priority work safety issues Factors: overtime fatigue, inexperienced workers, poor understanding of work processes, as well as the few workers who understand the usefulness of OSH in the project[9].

Rini Alfatiyah's 2017 research "Analysis of occupational health and safety risk management using the Hirarc method in the foundry section", is an implementation of the HIRARC method in the foundry section of PT. based. The XYZ Serpong Unit for Injury Prevention activities found that the critical threat phase types were 60%, namely core, LPDC and cutting processes. Types of risk effects up to 40 % are allowed are blasting and polishing steps[10].

A 2017 study on occupational health and safety (K3) risk management by Anak Agung Bayu Dharma

at the Jambuluwuk Petitenget Hotel and Resort Development Work found that environmental factors contributed the most to project implementation accidents by 38%. Facilities (equipment) accounted for 31%, people (people) accounted for 29%, (and materials) accounted for 25%. Workers are expected to be able to identify potential hazards based on their source by way of risk management based on the initial effects available so that workers are motivated to carry out their work activities in healthy and safe conditions[11].

A 2017 study by Siti Maisarah Lubis entitled Occupational Safety and Health (K3) Risk Management in Building Construction Projects (Research on Grand Jati Junction Housing Development) identified five categories of high-risk potential based on her analysis. Namely, for all excavation activities, formwork placement, iron soaking and ironing, the medium-risk category has 76 potential risks and the low-risk category has 5 potential risks[12].

A 2017 study on safety management in construction projects by Yousif S. Saeed found that the construction industry experiences high numbers of deaths and long-term injuries. This is unacceptable in modern society and also represents industrial inefficiency as days are lost to injuries. Studies show that the high rate of workplace accidents is caused by several factors, including poor construction planning, lack of safety in construction, inadequate safety training, worker behaviour, inherent safety risks in construction, and lack of knowledge of site regulations[13].

In a 2018 study by Winda, Purnama Tagueha entitled OHS Risk Management in Construction work, risk management and occupational health and safety have a major impact on the level of work safety. The more work safety is implemented in the project, the stronger the risk management[14].

In research on Occupational Safety and Health (K3) in Construction Projects in Bandung by Erni Kurniawati in 2018 that based on the results of an analysis of the occupational safety and health (K3) program in Bandung City, it was found that the implementation of the occupational safety and health (K3) program taking place in the city of Bandung prioritizing safety and reminding workers and the public who are outside the project by installing work safety sign boards, installing signs or information about the project, project fences or prohibitions on approaching the project, and escape routes for workers inside the project. The results of an analysis of the obstacles in implementing occupational safety and health (K3) in the city of Bandung show that the obstacles so far in implementing occupational safety and health (K3) have occurred due to obstacles from the workers' side.

In Ida Bagus Ngurah Purbawijaya's research in 2018 entitled Identification and Risk Assessment in the Condelet Watu Jimbar Sanur Project, based on the analysis results in each construction project, it is very important to carry out risk management to avoid losses to project quality. Risk assessment carried out includes identifying risks, understanding needs or considering risks, analyzing the impact of these risks/risk evaluations.

In research on The Safety Awareness of Construction Workers Regarding Workplace Health and Safety Standard by Pasha Nur Fauzinia in 2018 that based on the results of the analysis shows that not all workers understand the importance of occupational safety and health. Therefore, they rarely wear protective clothing even for their own safety.

In Sofiatul Muflihah's research in 2019 with the title Analysis of Occupational Safety and Health (K3) Risk Management in Building Construction Projects in Semarang that based on the results of data analysis it turns out that the application of Occupational Safety and Health (K3) is influenced by the competency skills/skills of workers, conditions (physical, psychological, and physiological), training and skills, and the state of the work environment.

In research on the Study on Risk Management of Occupational Safety and Health in Sipli Construction by A. Ansilin Mazhila in 2019 that based on the analysis results in each construction project it is very important to carry out risk management to avoid losses to project quality. The risk assessment carried out includes: risk identification, understanding needs or consider the risk, analyze the impact of the risk

the /risk evaluation.

In Ismiyati Ranggi Sanggawuri's research in 2019 with the title Application of Risk Management in Log Pier Extension Project Development (Case Study: Tanjung Emas Inner Port Semarang) that based on the results of the study indicated five risks in the high category according to the perception of the service provider that had the most influence on project delays. These risks include unpredictable external phenomena, such as tidal elevations that exceed the plan, resulting in changes to the design and implementation methods. The conclusions of this study include that the application of risk management for the implementation of the log jetty extension project at Tanjung Emas Semarang port needs to be implemented to minimize delays and reduce unexpected costs.

In research on the Implementation of Health, Safety and Environment (K3L) System Risk Management in the Development of the Pegangsaan 2 Kelapa Gading Flyover North Jakarta by Arif Rahman Hakim in 2017 that based on the results of filling out the questionnaire processed through a risk index, the result is that workers fall from a height of ironing, formwork, and parapet work got the greatest results, namely with a scale of 13.8 and at the lowest level, namely the risk of workers getting respiratory problems due to compressors on road marking work, namely with a scale of 5.5. In the risk matrix analysis, there are 3 jobs that are classified as high risk, namely workers falling from a height in ironing, formwork, and parapet work, workers getting electric shocks in electrical installation work, and material falling from a height and falling on workers during erection.

A construction project is a series of coordinated activities that can replace many resources into one or more goods or services with a measurable one-cycle system, with schedule, cost and quality deadlines that have been determined by agreement. This activity is only done once and is usually done in a short time. Construction Projects have several features including, construction projects are unique. Because projects are temporary and always involve different groups of workers and there is no exact sequence of work (no similar projects and no identical or the same projects). Construction projects require several resources to complete, these resources include workers and things like cost, machinery, design, and materials. The project requires a formation. Each formation or organization has different goals involving different people with different skills, interests, personalities and anxieties.

Types of construction projects include, Residential projects are residential or residential development projects based on development stages while still providing supporting infrastructure. Examples include roads, clean water, and electricity. Then, Building construction is the most common type of construction. This type of project focuses on design considerations, practical engineering, and regulatory considerations. And a type of heavy engineering project is the process of adding infrastructure to the built environment. The owner is usually a government agency in the national or regional territory of the building. Even though the project is non-profit and prioritizes public services, design factors, financial and legal considerations are still important considerations. Heavy industrial construction usually requires a high level of technology. In general, there are in infrastructure projects such as dams, highway projects, bridges, tunnels, railways and ports. According to Mancunegara, "Occupational Safety and Health (K3) is the integrity and wholeness of work and people in general, especially physically and mentally, guaranteeing work and culture results for a just and prosperous society, ideas and aspirations". While scientifically it is defined as knowledge and implementation to keep away from incidents, fires, explosions, pollution, disease, etc., K3 can be said as a step to improve health and safety at work and the mental health of workers, as well as the project environment to create a community equal and prosperous. K3 basically aims to keep away and avoid work incidents and abnormalities or problems due to employee work. Risk management in general is defined as a process of identifying, predicting and ensuring the consequences and expanding steps to manage those consequences. In this case risk management includes processes, methods and techniques that help project managers optimize the multiple possibilities and consequences of positive events and minimize the possibilities and consequences of adverse events. Project risk management is the art and science of identifying, describing, and responding to risks throughout the life of a building while ensuring that the project's mission is fulfilled. Risk management can have a positive impact on project selection, size, establishing a real agenda, and making cost-effective estimates. Risk scientifically can be interpreted as a

combination of functions from the frequency of occurrence, probability and consequences of the hazard that occurs. The benefits to be gained from the application of risk management are to assist decision making when dealing with complex problems, other benefits are easy cost estimating, provide opinions and intuition to make decisions that guide the right direction, enable decision makers to deal with risks and uncertainties in real situations, Decision makers can determine the amount of information needed to solve a problem, Increase the logical approach to taking steps, Provide guidance to support problem formulation, Alternative options can be analyzed carefully. Basically K3 looks for and combines several operational deficiencies that may occur incidents. This can be done by identifying the root cause of the problem and seeing if a thorough check can be carried out. Accident hazard can be caused by imperfect operational inattention, wrong decisions, wrong calculations, and improper management. Risk identification can be identified as an effort to find out the risks that may arise in activities in an individual or company.

Risk analysis is an activity to analyze risk by determining the probability of its occurrence and its acceptability. It aims to separate low, medium and high risks and provide data to support, assess and manage risk.

The risk assessment includes comparing the level of risk and risk tolerance (risk acceptance criteria), conducting a risk analysis, determining the risks to be handled based on the results, and determining the order of priority for the implementation of risk hedging. Risk assessment to find out the comparison of the level of risk determined by risk analysis against the risk characteristics determined as part of risk management.

2. METHODS

In this study, the type of data used is quantitative data. In general, quantitative data is more concrete because it can be quantified in the form of numbers. This data is objective and can be interpreted the same by everyone. If the results of measurements or observations can be expressed in units of measurement and certain numbers, then the collection of numbers is called quantitative data. Primary data is data obtained from first-hand or first-hand data sources obtained in the field. This data source was taken from the results of interviews and filling out questionnaires with related parties. In this study, a main contractor was selected who has competence and experience in the field of construction so that he can answer questions appropriately. Respondents from the study were employees involved in project development. The questionnaire used in this study is a questionnaire with a Likert Scale model. As Sugiyono (2011:93) has stated, the Likert scale is used to reveal attitudes, opinions, and perceptions of a person or group of people about social phenomena. In the Likert Scale, the variables to be measured are translated into variable indicators. Then the indicator is used as a starting point for compiling instrument items which can be in the form of statements or questions. The answers to each instrument item using the Likert Scale have a gradation from very positive to negative. To measure the variable used a Likert Scale of five levels, namely Strongly Agree, Agree, Disagree, Disagree, Strongly Disagree. Each answer point has a different score, that is, Strongly Agree answers have a score of 5, Agree answers have a score of 4, Less Agree answers have a score of 3, Disagree answers have a score of 2 and Strongly Disagree answers have a score of 1. Method This is used so that researchers can know and have data regarding the assessment given by each respondent so that further conclusions can be drawn. Secondary data is primary data that has been further processed. For example in the form of tables, graphs, diagrams, and so on. Secondary data is also information because it is the result of processing primary data which is already more informative.

The research begins with a literature study, formulation and problem definition to determine the population and sample and identify the variables used. After the data is processed and analyzed, then discussions and proof of hypotheses are carried out and end with conclusions and suggestions. This study uses quantitative data as a data type. Quantitative data are generally more specific because they can be quantified numerically. Primary data in the form of questionnaires to respondents (contractors, consultants, owners, workers) who participate in the project.

Secondary data is some primary data that has been processed in the form of tables, graphs, charts, etc. This data is also more informative data processed primary data[8].
Literature data, on the other hand, is reference data to obtain certain information. The library data used by researchers include research-related books (textbooks), teaching materials for teachers, research-related journals, and laws and regulations[15].

This study uses data in the form of questionnaires, two types of questionnaires will be distributed to respondents, the following are examples of questionnaires that will be used:

a. Phase 1 Questionnaire

Table 1. Sample Questionnaire Phase 1

No	Research Compensation	Questionnaire Results			
		1	2	3	∑
	K3 variable				
1	All workers can reach the project area safely	√	√	√	3
2	Project area boundaries have been installed on vacant land within the project to prevent workers from falling	√	√	√	3

No	Research Compensation	Questionnaire Results			
		1	2	3	∑
	Risk Management Variable				
1	The company trains workers in workplace safety procedures	√	√	√	3
2	Establish clear regulations and provide sanctions for violations of K3 regulations	√	√	√	3

b. Phase 2 questionnaire

Table 2. Example of a stage questionnaire

Variable	Statement	SS	S	KS	TS	STS
X	K3 variable	5	4	3	2	1
	1. All workers can reach the project area safely					
	2. Safety fences have been installed in vacant lots within the project to prevent workers from falling					
Y	Risk Management Variables					
	1. The company trains workers in workplace safety procedures					
	2. Establish clear regulations and provide sanctions for violations of K3 regulations					

The results of the questionnaire were analyzed by statistical tests including validity, reliability, correlation analysis and linear regression analysis. Linear Regression analysis is based on a functional or causal relationship between one independent variable with one dependent variable. The general equation for simple linear regression is:

$$y = a + Bx \quad (1)$$

Where:

y = subject in the predicted dependent variable

a = price Y when X = 0 (constant price)

b = the number of directions or the regression coefficient, which indicates the number of increases

3. RESULTS AND DISCUSSION

This research is carried out wherever possible and uses the scientific method. The contents of the research are as follows:

1. In this study, there were 30 respondents with the lowest education, namely high school/equivalent and the highest strata 2 (S2).
2. The results of the validity test, all valid X variables, namely X1, X2, X3, X4, X5, X6, X7, X8, X9, X10, X11, X12, X13, X14, X15, X16, X17, X18, X19, and X20, continue processing data. The r Alpha value of the Reliability test is 0.896, more than the reliable limit of data which is 0.6. Therefore the data is reliable or constant when used in further research.
3. The initial steps of the classic assumption test are the normality test, linearity test, person correlation test, and homoscedasticity test then carry out a linear regression analysis. In the normality test, all significance values or Sig values for each variable are greater than 0.05. It can be identified that the data obtained is normally distributed data. From the results of the linearity test, 2 variables did not pass the linearity test, namely X6 and X19. The results of the person correlation test produce values *Pearson Correlation*s equal to 0.623 > 0.361(r table). So the K3 variable (X) and the risk management variable (Y) are interconnected and have a strong correlation. The results of the heteroscedasticity test yielded a sig value for the K3 (X) variable with a value of 0.606 > 0.5. Therefore, the research data does not experience heteroscedasticity and can be used for further testing.

   Thus the data meets the classical assumption test requirements for linear regression analysis. Parametric statistics used in statistical analysis.
4. Multiple linear regression analysis was used in the analysis of this study, where each variable was analyzed separately (partially), namely the variable X to Y and together (multiple linear regression analysis), namely the variable Occupational Safety and Health (K3) and risk management.
5. The results of the coefficient of determination K3 (X) on risk management (Y) show that the value of R2 (R Square) is 0.714, this shows that 71.4% of risk management (Y) can be identified by changes in the Occupational Safety and Health variable (K3) (X). While the rest can be explained by other factors. Table 5.23 shows that the value of R2 (R Square) is 0.648, this shows that K3 (X) simultaneously has an effect of 64.8% of risk management (Y). This can explain why the resulting value can contribute to the attachment between the Dependent variable and the Independent variable. Based on PP RI No. 50 of 2012 concerning the Occupational Health and Safety Management System (SMK3), with a percentage value of 64.8% including the good application category, in this case, the OSH system has been applied to the project. The following is an assessment of K3 implementation based on application category:

Table 3. Application Category

Application Category	Application Percentage Rate
Very Satisfying Application	85-100 %
Good Practice	60-84 %
Less Application	0-59 %

Source: PP RI No. 50 of 2012

6. Based on the results of the F test for variable X, it has an F value of 4.647 and a significance value of 0.048, which means that the variable has a significance value of less than 0.05. Therefore, the Occupational Safety and Health (K3) variable (X) meets the requirements so that it is said to influence risk management (Y). Simultaneously, the F value is 4.325 and the sig value is 0.040. So that it simultaneously influences risk management (Y).
7. Based on the linearity test states that the relationship between X and Y is linear. This can explain why variable X is related to variable Y. So the application of K3 to the implementation of risk management is related. The more K3 is implemented in construction projects, the more risk management will increase.
8. Based on the results of the t-test on both variables, a linear regression equation is obtained, namely:

   Effect of K3 (X) on risk management (Y)

Y =66.602 + 5.118 X1–0.699 X2–6.995 X4 + 3.543 X7 + 0.702 X9–1.629 X12 + 6.053 X13–6,092X18

9. From the multiple linear regression test of each tested sub-variable that has a significant effect, there are eight sub-variables, namely: variables X1, X2, X4, X7, X9, X12, X13, and X18 on risk management (Y). The variable that has the greatest influence and becomes the dominant factor is X13, which is a sign or information sign related to the project that has been installed around the project area.
10. The research hypothesis was obtained based on the results of the tests which resulted in H0 being rejected and H1 is accepted. It can be concluded as follows:
    H0: There is no OHS effect on risk management
    H1: There is an influence of K3 on risk management

Table 4. Hypothesis Results

No	Variable	Influence Percentage (%)
1	K3	71.4 %
2	Simultaneous	64.8 %

The table above has an understanding where K3 has an effect of 71.4% on risk management and simultaneously has an effect of 64.8% on risk management.

Table 5. Final Validation (Expert)

No	Expert	Agree/Disagree	Comment
1	Expert 1	Lecturer/ Academics Agree	The results carried out are by the data and the results have answered the formulation of the problem in this study
2	Expert 2	Lecturer/ Academics Agree	Because the project is on a river, the results are by the conditions in the field and the input from this research can be applied to the next river construction project
3	Expert 3	Practitioners Agree	In this study, the method must be understood and added related to river construction projects

After the research result are obtained using multiple regression analysis method, then confirmed to the expert regarding the final validation for determine whether the results of this study are valid or not. This final validation is addressed to 3 (three) experts, two from academics and one from practitioners. All of the experts agree with result of the analysis application of occupational safety and health (X) to implementation risk management (Y).

4. CONCLUSION

In research on the Analysis of the Application of K3 and the Application of Risk Management in the Cipunten Agung Hilir River Flood Handling Construction Project, Labuan District. Therefore several conclusions were obtained, namely, the simultaneous determination test results of the K3 system had been applied to the Cipunten Agung Hilir River Flood Handling Construction Project, Labuan District, with a percentage of 64.8% and included in the good implementation. The results of the f-test analysis with a relationship value of 71.4%, the relationship between the application of OHS and risk management is obtained, namely, the more Occupational Safety and Health (K3) is implemented in construction projects, the more risk management will increase in construction projects. Cipunten Agung River Flood Handling Downstream of Labuan District. The results of the regression analysis obtained the regression formula:

Y = 66.602 + 5.118 X1−0.699 X2−6.995 X4 + 3.543 X7 + 0.702 X9−1.629 X12 + 6.053 X13−6,092X18
The dominant factors influencing the implementation of the K3 system and the application of risk management are as follows:
X1: A sig value of 0.425 means that all workers can reach the project area safely.
X2: Project area boundaries with a sig value of 0.879 are installed on vacant land within the project to prevent workers from falling.
X4: Work clothes, helmets, boots, gloves, masks, safety belts, etc. have been provided by the company, with a sig value of 0.363
X7: Experienced workers who operate factories and machines and have a sig value of 0.655.
X9: To prevent fires, a smoking ban policy is applied with a sig value of 0.047 in the project area.
X12: Fences and entrances/exits are in good condition in the project area and have a sig of 0.773.
X13: Signs/Signs/Information about the project are placed around the project site and have a sig value of 0.287.
X18: A first aid kit is available for workers with a sig value of 0.215.

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